AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1.   (currently amended) A personal authentication method using iris images, comprising a registration process and an authentication process,

the registration process including [[the]] steps of:

capturing, by a capture device, ~~acquiring~~ a plurality of iris images from a registrant;

obtaining feature data and a pupil opening degree index from each of the plurality of iris images and associating that obtained pupil opening degree index with those obtained feature data;

~~generating a pupil opening degree index from the obtained pupil opening degrees and~~ using the pupil opening degree indices to index[[ing]] the obtained feature data of the registrant ~~using the pupil opening degree index as keys for retrieving in an iris database~~; and

performing data registration for the registrant ~~in the iris database using~~ including storing the obtained feature data, ~~and~~ the pupil opening degree ind~~ices~~[[ex]], and index relationship between the obtained feature data and the pupil opening degree indices, of the registrant, in an iris database device, and

the authentication process including [[the]] steps of:

capturing, by a capture device, ~~acquiring~~ an iris image from a person to be authenticated;

obtaining feature data and a pupil opening degree <u>index, of the person to</u> <u>be authenticated,</u> from the acquired iris image;

~~generating a key of the pupil opening degree index corresponding to the~~ ~~obtained pupil opening degree; and~~

using ~~the key through~~ the pupil opening degree index <u>of the person to be</u> <u>authenticated</u> to obtain <u>the</u> feature data<u>, as feature data to be collated, that is</u> <u>associated with that pupil opening degree index of the person to be authenticated</u> ~~to be~~ ~~collated~~ from <u>feature</u> data registered ~~for the registrant~~ in the iris database<u> device</u>; [[and]]

comparing the feature data to be collated with the feature data obtained <u>from the person to be authenticated</u> in the authentication process to determine whether or not the person to be authenticated is ~~identical to~~ the registrant<u>; and</u>[[.]]

<u>outputting the comparing result through an output device.</u>

2.　　(original)　The personal authentication method of claim 1, wherein:

the registration process includes the step of registering the feature data together with the pupil opening degree index in the iris database in conjunction with the registrant; and

the authentication process includes the step of specifying the feature data to be collated from feature data registered in the iris database in conjunction with a registrant by comparing the pupil opening degree index obtained in the authentication process with the pupil opening degree index registered together with the feature data.

3. (original) The personal authentication method of claim 2, wherein the registration process includes the step of at least registering three pieces of feature data of the registrant obtained from iris images in a pupil-contracted state, in a normal state, and in a pupil-dilated state, respectively.

4. (original) The personal authentication method of claim 2, wherein the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from the registrant;

obtaining feature data from each of the plurality of acquired iris images; and

collating the plurality of pieces of feature data with each other to select feature data to be registered in the iris database from the plurality of pieces of feature data.

5. (original) The personal authentication method of claim 2, wherein the authentication process is aborted when feature data having a pupil opening degree index which is close to the pupil opening degree index obtained in the authentication process by a predetermined difference is not registered for the registrant.

6. (original) The personal authentication method of claim 5, wherein when the authentication process is aborted,

a preferable condition for capturing an iris image is estimated based on the pupil opening degree index obtained in the authentication process and a pupil opening degree index associated with registered feature data, and

the person to be authenticated is advised to re-acquire an iris image under the estimated capturing condition.

7.   (original) The personal authentication method of claim 1, wherein

the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from the registrant;

obtaining a relational expression between feature data and a pupil opening degree index based on a plurality of pieces of feature data and pupil opening degree indices obtained from the plurality of acquired iris images; and

registering parameters for expressing the relational expression in the iris database in conjunction with the registrant, and

the authentication process includes the step of obtaining a relational expression from parameters registered in the iris database in conjunction with a registrant and assigning the pupil opening degree index obtained in the authentication process to the relational expression to obtain the feature data to be collated.

8.   (currently amended) The personal authentication method of claim 7, wherein:

the registration process includes the step of ~~thinning~~ reducing the number of the parameters before registration; and

the authentication process includes the step of restoring the ~~thinned~~ reduced number of parameters by interpolation.

9.   (original) The personal authentication method of claim 1, wherein

the registration process includes the steps of:

acquiring a plurality of iris images having different pupil opening degrees from

the registrant;

specifying registration feature data from a plurality of pieces of feature data

obtained from the plurality of acquired iris images and obtaining a transformation rule

for transforming the registration feature data to another feature data having a different

pupil opening degree index; and

registering the registration feature data and the transformation rule in the iris

database in conjunction with the registrant,

the authentication process includes the step of generating the feature data to be

collated using the pupil opening degree index obtained in the authentication process

based on feature data and a transformation rule registered in the iris database in

conjunction with a registrant.

10.   (original) The personal authentication method of claim 1, wherein the

pupil opening degree index is the ratio of a pupil diameter to an iris diameter in an iris

image.

11.   (currently amended) A personal authentication method using iris images, comprising:

[[the]]a first step of capturing, by a capture device, ~~acquiring~~ an iris image from a person to be authenticated;

[[the]]a second step of obtaining feature data and a pupil opening degree index, of the person to be authenticated, from the iris image obtained at the first step;

~~the third step of generating a key of a pupil opening degree index corresponding to the obtained pupil opening degree and~~ using ~~the key through~~ the pupil opening degree index of the person to be authenticated to obtain the feature data, as feature data to be collated, that is associated with that pupil opening degree index of the person to be authenticated from feature data registered ~~for a registrant~~ in an iris database device in which data registration has been done using [[the]] pupil opening degree indices[[ex]] ~~with a key corresponding to the pupil opening degree obtained at the second step~~; [[and]]

[[the]]a fourth step of comparing the feature data to be collated which is obtained at the third step with the feature data obtained at the second step to determine whether or not the person to be authenticated is ~~identical to the~~ a claimed registrant; and

a fifth step of outputting the comparing result through an output device.

12.   (original) The personal authentication method of claim 11, wherein:

the iris database stores at least one piece of feature data for each registrant together with a pupil opening degree index; and

at the third step, a pupil opening degree index registered together with the feature data, which is selected from the at least one piece of feature data registered in the iris database in conjunction with the registrant, is compared with the pupil opening degree index obtained at the second step to specify the feature data to be collated.

13. (original) The personal authentication method of claim 11, wherein:

the iris database stores parameters which express a relational expression between feature data and a pupil opening degree index for each registrant; and

at the third step, a relational expression is obtained from the parameter registered in the iris database in conjunction with a registrant, and the pupil opening degree index obtained at the second step is assigned to the relational expression, whereby the feature data to be collated is obtained.

14. (original) The personal authentication method of claim 11, wherein:

the iris database stores feature data and a transformation rule for transforming the feature data to another feature data having a different pupil opening degree index for each registrant; and

at the third step, the feature data to be collated is generated using the pupil opening degree index obtained at the second step based on the feature data and the transformation rule registered in the iris database in conjunction with a registrant.

15.   (currently amended)   An iris registration device which performs data registration for iris authentication, comprising:

means for acquiring a plurality of iris images from a registrant;

means for obtaining feature data and a pupil opening degree index from each of the plurality of iris images and associating that obtained pupil opening degree index with those obtained feature data;

means for ~~generating a pupil opening degree index from the obtained pupil opening degrees and~~ using the pupil opening degree indices to index[[ing]] the obtained feature data of the registrant ~~using the pupil opening degree index as keys for retrieving in an iris database~~; and

means for performing data registration for the registrant ~~in the iris database using~~ including storing the obtained feature data, [[and]] the pupil opening degree indices[[ex]], and index relationship between the obtained feature data and the pupil opening degree indices, of the registrant, in an iris database.

16.   (currently amended)   An iris authentication device which performs personal authentication using iris images, comprising:

means for acquiring an iris image from a person to be authenticated;

means for obtaining feature data and a pupil opening degree index, of the person to be authenticated, from the acquired iris image;

means for ~~generating a key of a pupil opening degree index corresponding to the obtained pupil opening degree and~~ using ~~the key through~~ the pupil opening degree index of the person to be authenticated to obtain the feature data, as feature data to be

collated, that is associated with that pupil opening degree index of the person to be authenticated from feature data registered ~~for a registrant~~ in an iris database device in which data registration has been done using [[the]] pupil opening degree ind~~ices~~[[ex]] ~~with a key corresponding to the obtained pupil opening degree~~; and

means for comparing the feature data to be collated with the feature data obtained from the person to be authenticated to determine whether or not the person to be authenticated is ~~identical to the~~ a claimed registrant.

17.   (currently amended)   A ~~recording medium~~ memory encoded with a program for instructing a computer to execute personal authentication using iris images, comprising the steps of:

obtaining feature data and a pupil opening degree index, of the person to be authenticated, from an iris image acquired from a person to be authenticated;

~~generating a key of a pupil opening degree index corresponding to the obtained pupil opening degree and~~ using ~~the key through~~ the pupil opening degree index of the person to be authenticated to obtain ~~the~~ feature data, as feature data to be collated, that is associated with that pupil opening degree index of the person to be authenticated from feature data registered ~~for a registrant~~ in an iris database device in which data registration has been done using [[the]] pupil opening degree ind~~ices~~[[ex]] ~~with a key corresponding to the obtained pupil opening degree~~; and

comparing the feature data to be collated with the feature data obtained from the person to be authenticated to determine whether or not the person to be authenticated is ~~identical to the~~ a claimed registrant.